Pham, Thanhha

From: Harrison, Jeff
Sent: Wednesday, July 02, 2003 5:24 PM
To: Pham, Thanhha
Cc: Harrison, Jeff
Subject: Dow Corning 9-5115 HSQ

Thanhha,

HSQ has a generic chemical formula **HSiO sub 3/2 sub n.**

I have been unable to differentiate any difference between Dow Corning 9-5115 HSQ and any of the other HSQ films.

Should I look into it more next week?

REGISTRY COPYRIGHT 2003 ACS
RN 308075-92-5 REGISTRY
* Use of this CAS Registry Number alone as a search term in other STN files may result in incomplete search results.
CN Silsesquioxanes, hydrogen (CA INDEX NAME)
OTHER NAMES:
CN Dow Corning FOx
CN FOX 12
CN FOx 14
CN FOX 15
CN HSQ
CN Hydrogen silsesquioxanes
CN Hydrogenosilsesquioxane
CN OPX (silsesquioxane)
CN XLK 15
CN XLK 6
MF Unspecified

DIALOG(R)File 654:(c) FORMAT ONLYTHE DIALOG CORP. All rts. reserv.
Method of forming a multilevel dielectric

	Publication Number	Kind	Publication Date	Application Number	Filing Date
Main Patent	**US 5607773**	A	19970304	US 94359784	19941220

Abstract:
A method of forming a planar dielectric layer over an interconnect pattern which requires fewer processing steps and has a lower dielectric constant than is obtained in the prior art. The method comprises providing a substrate having an electrical interconnect pattern thereon, forming a first layer of dielectric over the interconnect pattern, preferably by plasma generated TEOS oxide, forming a porous second layer of silicon-containing dielectric with low dielectric constant different from the first layer over the first dielectric layer from an inorganic silicon-containing composition, preferably hydrogen silsesquioxane and forming a third layer of dielectric different from the second layer over the second dielectric layer, preferably by a plasma generated TEOS oxide. The step of forming the second layer comprises the steps of depositing an inorganic silicon-containing composition capable of being pyrolytically converted to a silicon oxide over the first layer and placing the resulting structure in an essentially pure nitrogen and essentially moisture-free environment at a pressure at or below atmospheric pressure and then heating the silicon-containing composition to a temperature of from about 375[degree(s)] C. to about 425[degree(s)] C. and preferably 400[degree(s)] C. for from about 30 minutes to about 90 minutes to convert the silicon-containing composition to silicon oxide.
Summary of the Invention:
No special treatment is required at cure, etch or during the metal deposition steps. The inorganic source of silicon oxide, which is preferably **hydrogen silsesquioxane (HSQ), has the chemical formula (HSiO[sub]3/2)[sub]n and is also known as Dow Corning Corporation's 9-5115 dielectric material,** is used in place of the organic methylsiloxane in the

spin on glass. This material is used in conjunction with a carefully designed but simple set of process steps which enable both the simplified manufacturing process and the lower dielectric constant. The dielectric constant of an HSQ film is believed to be linked to the SiH and --OH bonds in the film and has a lower dielectric constant than plasma TEOS oxide...

L85 ANSWER 1 OF 6 HCAPLUS COPYRIGHT ACS
AN 2003:71476 HCAPLUS
DN 138:145161
TI Liquid crystal display with FOP (Finger On Plane) electrode structure
IN Okishiro, Kenji; Oaku, Hitoshi; Tomioka, Yasushi
PA Hitachi Ltd., Japan
SO Jpn. Kokai Tokkyo Koho, 22 pp.
CODEN: JKXXAF
DT Patent
LA Japanese
IC ICM G02F001-1333
ICS G02F001-1368
CC 74-13 (Radiation Chemistry, Photochemistry, and Photographic and Other Reprographic Processes)
Section cross-reference(s): 76
FAN.CNT 1

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI JP 2003029247	A2	20030129	JP 2001-216790	20010717
PRAI JP 2001-216790		20010717		

AB The invention relates to a liq. crystal display with FOP electrode structures, wherein the FOP electrode structure includes a first insulator film and a second insulator film having specified dielec. consts. and specified thickness. The display shows reduced ghost image formation.
ST liq crystal display FOP electrode structure insulator film
IT Silsesquioxanes
RL: DEV (Device component use); USES (Uses)
(hydrogen, Dow Corning FOx; insulator film in liq. crystal display with FOP (Finger On Plane) electrode structure to reduce ghost image formation)

L85 ANSWER 2 OF 6 HCAPLUS COPYRIGHT ACS
AN 2002:162558 HCAPLUS
DN 137:130580
TI Thermal conductivity and sound velocities of hydrogen-silsesquioxane low-k dielectrics
AU Costescu, Ruxandra M.; Bullen, Andrew J.; Matamis, George; O'Hara, Keith E.; Cahill, David G.
CS Department of Materials Science and Engineering, Coordinated Science Laboratory, and Materials Research Laboratory, University of Illinois, Urbana, IL, 61801, USA
SO Physical Review B: Condensed Matter and Materials Physics (2002), 65(9), 094205/1-094205/6
CODEN: PRBMDO; ISSN: 0163-1829
AB Thermal conductivities of hydrogen-silsesquioxane thin films - Dow Corning "flowable oxide" and nanoporous "extra-low-k" spin-on dielecs. - are measured in the temp. range 80-400 K using the 3.omega. method. Film thickness and at. densities are characterized by the combination of Rutherford-backscattering spectrometry and variable-angle spectroscopic ellipsometry. Measurements of the longitudinal speeds of sound by picosecond ultrasonics and interferometry enable comparisons with the model of the min. thermal cond. of homogeneous materials. This model fails to capture the strong temp. dependence of the cond. Data for nanoporous silsesquioxane and SiO2 are compared to the predictions of effective medium theories of heterogeneous materials. Differential-effective-medium theory predicts a scaling of thermal cond.

.LAMBDA. with at. d. n, .LAMBDA. .varies. n3/2, in good agreement with expt. The comparisons with effective-medium theories suggest that a greater control of pore microstructure may enable significant improvements in the thermal and mech. properties of porous dielecs.

L85 ANSWER 3 OF 6 HCAPLUS COPYRIGHT ACS
AN 2002:110802 HCAPLUS
DN 136:333354
TI Properties of porous HSQ-based films capped by plasma-enhanced chemical vapor deposition dielectric layers
AU Iacopi, F.; Baklanov, M. R.; Sleeckx, E.; Conard, T.; Bender, H.; Meynen, H.; Maex, K.
CS IMEC, Louvain, B-3001, Belg.
SO Journal of Vacuum Science & Technology, B: Microelectronics and Nanometer Structures (2002), 20(1), 109-115
CODEN: JVTBD9; ISSN: 0734-211X
PB American Institute of Physics
DT Journal
LA English
CC 76-3 (Electric Phenomena)
AB This article presents a study on Dow Corning XLK, an inorg. porous material with about 50% porosity and a dielec. const. of 2.0. It focuses on matters linked to sealing the porous film by depositing a PECVD deposition dielec. cap layer. The study shows that the material can be modified during cap deposition due to the fast diffusion of reactants and radicals through the porous network, and acquire totally new properties which can be either beneficial or detrimental, depending on the chosen process. In particular, it is found that cap deposition processes on XLK in an oxidizing ambient, as used for SiO2 deposition, should be avoided. On the other hand, a beneficial modification of the dielec. film has been obsd. after SiC:H capping. It is also shown that there exists a crit. thickness of capping material below which the cap layer reveals the presence of pinholes. The crit. thickness value for a PECVD SiC:H cap layer on top of an XLK film is around 25 nm.

L85 ANSWER 4 OF 6 HCAPLUS COPYRIGHT ACS
AN 2001:728558 HCAPLUS
DN 136:29915
TI Plasma treatment of hydrogen silsesquioxane (HSQ) based ultra low-k films
AU Han, Qingyuan; Waldfried, Carlo; Berry, Ivan; Chen, Wei; Moyer, Eric S.; Liu, Youfan; Spaulding, Michael J.
CS Axcelis Technologies, Inc., Rockville, MD, 20855, USA
SO Proceedings - Electrochemical Society (2001), 2000-27(Copper Interconnects, New Contact Metallurgies/Structures, and Low-K Interlevel Dielectrics), 184-189
CODEN: PESODO; ISSN: 0161-6374
PB Electrochemical Society
DT Journal
LA English
CC 76-3 (Electric Phenomena)
AB A H2/N2 + CF4 plasma treatment followed by a rapid thermal annealing process has been developed to modify the inner structure of Dow Corning porous XLK films for improved material properties. A thermally cured XLK film exhibits characteristic Si-H vibrational bonds which are removed during the plasma treatment, resulting in significant enhancement of the mech. properties of the XLK film. The Young's modulus increases from less than 3 GPa for the untreated XLK film to more than 6 GPa after the plasma process. Accompanied by the modulus increase of the plasma treatment, the films exhibit an increase in the dielec. const., which can be successfully restored to its original low k-value of XLK by a

two-minute rapid thermal annealing at 450.degree..

L85 ANSWER 5 OF 6 HCAPLUS COPYRIGHT ACS
AN 2001:728557 HCAPLUS
DN 136:30221
TI Structural properties of porous ultra low-k thin films
AU Chen, Wei; Deis, Thomas A.; Liu, Youfan; Bremmer, Jeffrey N.; Lin, Eric K.; Gidley, Dave W.; Chiou, Wen-An
CS Dow Corning Corporation, Midland, MI, 48686, USA
SO Proceedings - Electrochemical Society (2001), 2000-27(Copper Interconnects, New Contact Metallurgies/Structures, and Low-K Interlevel Dielectrics), 175-183
CODEN: PESODO; ISSN: 0161-6374
AB A new generation of porous silica thin films (Dow Corning XLK) has been developed based on hydrogen silsesquioxane (HSQ) resin treated with moist ammonia and followed by a thermal cure. The thin-film properties were tailored at low dielec. consts., from 2.0 to 2.5, with excellent mech. integrity. A no. of methods have been applied to understand the structural properties of these porous low-dielec.-const. films. A combination of small-angle neutron scattering and x-ray reflectivity was used to obtain the av. pore size, porosity, and wall-d. information. Further, positron annihilation lifetime spectroscopy (PALS) was employed to investigate the properties of pores in the films, such as pore size and connectivity of the pores. In addn., the pores in the films were imaged using TEM microscopy. The results indicate that the av. dimensions of the interconnected pores in the XLK films are in order of nanometers.

L85 ANSWER 6 OF 6 HCAPLUS COPYRIGHT ACS
AN 1999:14695 HCAPLUS
DN 130:183140
TI Effect of curing temperature on the mechanical properties of hydrogen silsesquioxane thin films
AU Liou, Huey-Chiang; Pretzer, John
CS Semiconductor Fabrication Materials, Dow Corning Corporation, Midland, MI, 48686-0994, USA
SO Thin Solid Films (1998), 335(1,2), 186-191
CODEN: THSFAP; ISSN: 0040-6090
PB Elsevier Science S.A.
DT Journal
LA English
CC 37-5 (Plastics Manufacture and Processing)
Section cross-reference(s): 76
AB The mech. properties and thermal stresses of hydrogen silsesquioxane (HSQ) thin films cured at different temps. have been investigated by a nanoindentor and a profilometer. In this study, the correlations between structure change, Si-H/Si-O ratio, modulus, hardness, and calcd. coeff. of the thermal expansion of HSQ films have been established. The results show that the Si-H/Si-O ratio of HSQ films decreases with increasing curing temp. due to the loss of Si-H bonds when it forms the network structure at higher curing temps. In addn., both the modulus and hardness of HSQ films increase with increasing curing temp. However, the calcd. coeff. of thermal expansion (CTE) decreases with increasing curing temp. These results indicate that the increase in modulus and hardness and the decrease in CTE are due to the conversion of Si-H into Si-O bonds with the redn. in porosity when forming the network structure in the HSQ films at higher cure temps.

L91 ANSWER 1 OF 5 ANABSTR COPYRIGHT RSC AN 64(9):E81 ANABSTR

TI X-ray reflectivity and FTIR measurements of nitrogen plasma effects on the density profile of hydrogen silsesquioxane thin films.

AU Lee, H. J.; Lin, E. K.; Wu, W. L.; Fanconi, B. M.; Lan, J. K.; Cheng, Y. L.; Liou, H. C.; Wang, Y. L.; Feng, M. S.; Chao, C. G. (Polymers Div., Natl. Inst. Standards and Technol., Gaithersburg, MD 20899, USA)

SO J. Electrochem. Soc. (2001) 148(10), F195-F199 CODEN: JESOAN

AB Hydrogen silsesquioxane thin films were analysed by X-ray reflectivity and FTIR spectrometry to measure density depth profiles and study chemical bond structures. The effects of N2 plasma treatment on the density profiles were studied. The treatment converted the films to a SiO2-like structure and densified the surface. Plasma power was a greater factor in the changes then plasma exposure time.

IT Analyte(s):
films, thin
(characterization of hydrogen silsesquioxane, by FTIR spectrometry and X-ray spectrometry)
308075-92-5, hydrogen silsesquioxanes

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CP4-9C18, 703-306-5429